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AUTHOR Osterman, Dean N.; Coffey, Betty
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ABSTRACT

This paper describing a newly created instructional approach developed at Oregon State University focuses on discussions of the process, a guided design decision-making strategy used by a team of instructors to design and develop the product, i.e., the feedback lecture approach, which is examined both in its developmental stage and in its measured effectiveness. The report defines the lecture method and lists its strengths and weaknesses, offers some suggestions on improving the lecture technique, provides background information on the feedback lecture, describes the guided design steps for creating the feedback lecture, identifies steps in decision making, details guided design steps used to arrive at a solution, and discusses the evaluation of feedback lectures. Appendices provide a study guide sample from a feedback lecture and a case study of the feedback lecture in practice. References are listed. (FM)

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A new Teaching Approach: The Feedback Lecture

by

Dean N. Osterman, Ph.D.
Coordinator of the College
and University Teaching
Project and Instructional
Development
Oregon State University
Corvallis, Oregon 97331

and
contributing Case study
by
Betty Coffey
Instructor IE/CE Department
Montana State University
Bozeman, Montana 59715

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Organization

This paper focuses upon two discussions pertinent to redesigning the traditional lecture form of teaching and learning. One description provides the reader with the process (Guided Design decision-making strategy) used by a team of instructors and the author to design and develop the product, a newly created instructional approach developed at Oregon State University. The product, Feedback Lecture, is described in its developmental stage to the research conducted on its effectiveness.

The organization of the paper is as follows: Introduction to the content of the paper; Definition of the lecture; Applications of the lecture to classroom teaching; Advantages and Disadvantages of the lecture; what can be done in Improving the Lecture; Background on the Feedback Lecture; Using Guided Design to Create the Feedback Lecture; Steps In Decision Making; Guided Design Steps Used to Arrive at a Solution; Evaluation of Feedback Lectures; Author's Comments; Components of Feedback Lecture; Conclusion; Appendix, Item one, a study guide sample from a Feedback Lecture, and finally Appendix, Item two, a case study of the Feedback Lecture in practice.

Introduction

What can be done to improve upon the lecture? The conventional lecture is in trouble for several reasons.

Over the last forty years, the lecture has come under increasing fire for its alleged inadequacies as a teaching method compared with the other methods. Several reviews of such researchers have appeared in the last decade. Amongst them, McKeachies (1963), Beard (1967), McLeish (1968), Gage (1969), Powell (1970), and Costin (1972).

On the positive side, the lecture remains to be the best teaching technique for passing on factual information, but as Powell (1970) writes it, "it is much less suited to the development of high-level intellectual skills and attitudes." The lecture continues to be used, and the case for its use appears to be strong in view of the growing size of university and college classes, the pressures for more economical use of academic staff, and the ever-increasing volume of basic knowledge. These factors represent a teaching task perhaps greater than can be efficiently tackled by exclusive use of less formal methods. Furthermore, there seems to be something deep inside most people that responds to the expert's telling. The investigations into student evaluations of lectures report that students enjoy good lectures and dislike poor ones; most of all-they also don't want too many lectures.

It seems appropriate then, to consider how the lecture might be used to the best advantage. The variables that may influence its effectiveness are many and varied. Some activities, such as weather and social events affecting classroom behavior, are not within the teacher's influence; while other activities are inside the teacher's control. The author's hope is that this paper will help teachers become aware of the variables that they may control in terms of contribution to more effective use of the lecture.

The paper begins with a definition of the lecture method. This is followed by a list of used and an indication of the lecture's strength and weaknesses. Some suggestions for effective lecturing follow the Feedback Lecture description and "How to Create This Approach" concludes. The Feedback Lecture, used as a method of improving lectures, is presented towards the latter part of this paper. Part of the author's discussion

will focus upon the conventional lecture, that of the teacher-oriented professor providing content via the spoken work, the main teaching vehicle used in colleges and universities.

Definition

The lecture method has been vigorously defined, but essentially it involves a single teacher teaching a group of students, usually numbering 20 or more, mainly or exclusively by verbal exposition. In its extreme form, communication is one-way, from teacher to student, but today more and more teachers are using hybrid models such as the Feedback Lecture. In addition, a lecture may also contain, for instance, audio-visual aids and other means of demonstration, questions from the audience, brief discussion and testing.

Applications

A few of the applications of the conventional lecture are suggested as in the following:

1. To stimulate and provide a framework for private studies and guidance as to sources, when the lecture supplies the basic teaching.
2. To furnish information and viewpoints that are not readily available or not available in an appropriate form (data from the lecturer's own research);
3. To stimulate and enthuse thinking;
4. To encourage a critical attitude;
5. To provide an appropriate model of such qualities and attitudes as precision, clarity of thought and expression, authority and humility;
6. To summarize the results of group activities.

Advantages and Disadvantages

The major advantages and disadvantages of the lecture are as follows:

Advantages

The lecture...

a) is a familiar method;

b) is economical of staff time;

c) can be given to a large audience;

d) is easily prepared;

e) can cover much ground in a short period of time;

f) is adaptable in respect of audience, content, time and equipment;

g) permits spontaneity;

h) is amenable to recording and transcript;

i) is, at its best, an organized and systematic presentation of content.

Disadvantages

The lecture...

a) can do little to cater for students' differences;

b) provides little opportunity for judging audience understanding and reaction accurately;

c) often places heavy reliance on students' note-taking skills and memory, and the quality of information received tends to vary from student to student;

d) demands sustained aural and possibly visual concentration;

e) provides limited opportunity for active student involvement and participation;

f) may do little to develop high-level intellectual skills and attitudes;

g) requires careful preparation and presentation;

h) does little to stimulate the initutive hemisphere of the brain,

i) usually rational thoughts are presented and taught.

Improving the Lecture

In an effort to improve upon the lecture re-designing it to eliminate as many disadvantages as possible, the author examined the constraints and limitations faced by faculty. In most cases, the professor is more-or-less fixed into a lecture track. The chairs in the classroom are either permanently attached or cannot be moved around to accommodate small group discussions. The professor lacks time or skills in order to develop any alternative form of teaching.

The evaluator providing peer or supervisory feedbacks for promotion and tenure purposes is unaware of alternative teaching methods and is accustomed to seeing good lecture performance. Lastly, the budget is set up for cost-effective measures leaving no funds for equipment, proctors, teaching materials, and other innovative forms of instruction. So, what do you have left to work with? Obviously, the lecture. More importantly, what can be done to:

1. increase the involvement and participation of students;
2. cover less content in class, but thoroughly cover main concepts;
3. provide reinforcement to students with repetition and application;
4. test the students and judge audience understanding and reaction during the lecture;
5. provide a framework for students to follow in the form of objectives, prerequisite knowledge available prior to the lecture, main notes, discussion, lecture theme, follow-up assignments, related student activity both before and after the

lecture, and most important--establish methods of receiving feedback from students and providing feedback to students;

6. maintain consistency and uniformity between lectures, terms or semesters, and perhaps different instructors teaching the course;
7. prepare lectures that enable students to reach higher levels of learning (analysis, synthesis, evaluation); and
8. improve students' attitudes and achievements.

Background on the Feedback Lecture

To meet this challenge of promoting increased learning from the lecture, programmed instruction features were added to the original construction of the Feedback Lecture method of teaching. Originally it was called Programmed Lecture with emphasis upon rigid components developing programmed responses. With the added feature of obtaining and providing feedback to the students, thus the emphasis changed along with the name. A few of the features of programmed instruction were retained as a result of the implications derived from research. There is some evidence, though slight, that programmed instruction may have an advantage over conventional lectures for helping students learn facts and concept.

The Feedback Lecture has now been used for five years in disciplines such as Clothing Textiles and Related Arts, Physics, Mechanical Engineering, Speech Mathematics, Industrial and Computer Engineering, Physical Education, Broadcast Communications, Nursing, Art, History, Automobile Mechanics, and other subject areas. The evidence in the research that has been conducted is positive. Related studies indicate increased achievement and improved attitudes in students as compared with the conventional lecture.

The first instructor to use the Feedback Lecture approached the author for aid in Instructional Development. He listed a set of constraints and problems calling for a change in his traditional lecture format! He needed to maintain the lecture and wanted to increase student involvement through notes, discussions, related assignments, and organization. An added feature is that is was necessary to measure student growth prior to and immediately following the lecture.

The author, in working with other instructors, formulated a "team" of instructors who were concerned about the conventional form of lecturing. The team, then, needed additionally to use a decision-making strategy for arriving at solutions to the problems as each described with the lecture. In that the author had used the Guided Design teaching approach for teaching content and decision-making to students, Guided Design was chosen (because of its success at reaching solutions) as the method for the group to use for guiding them in arriving at decisions. The group needed to learn (as the reader may need to learn) of the Guided Design method.

Using Guided Design to Create The Feedback Lecture

Guided Design, as developed by Charles E. Wales, West Virginia University and Robert A. Stager, University of Windsor, is a teaching approach providing small-group discussion, problem-solving activities related to real world situations, and increased motivation and subject matter retention. Guided Design is an educational strategy, part system, part attitude. It reshapes the traditional approach (lecture format) by having students, working in small groups, attack open-ended problems rather than masses of cold information. It is based on the conviction that the student who works through an ascending order of well designed problems and actively seeks

solutions to problems rather than passively assimilating knowledge, will emerge not only better educated but far stronger intellectually (Wales and Stager, 1975).

Although Guided Design is designed as a better way of teaching many disciplines, it becomes apparent that its strategy can be adapted to perhaps many other uses -- as an example resolving problems relating to instruction. The Guided Design teaching format may not fit the constraints and limitations facing the instructor (large student population, pressure from the dean or colleagues to use the lecture, large lecture halls); however the Guided Design process of devising solutions can be put to use. The Guided Design approach, when used for teaching, provides written feedback, prepared in advance by the professor. The material presents one or more possible decisions the group may have reached as they progress through problem-solving elaborating upon the strengths and weaknesses of each. After the students compare the pros and cons of their decision with those of the professional, they are allowed to advance to the next step in the problem. The steps for group problem - solving, as listed in table one, guide the students towards good, better, best solutions.

Table 1

STEPS IN DECISION-MAKING

* Gather Information

This step is listed first because it is usually a component of each step in the decision-making process. It involves a search for pertinent information from the person's own background, books, printed matter, media, other people, experts and experimental work.

A. Identify the Problem

Someone may ask you to solve a problem or you may discover it by yourself. In either case you must learn to look beyond the symptoms of the problem to find out what is wrong.

B. State the Basic Objective or Goal

The Basic Objective focuses your thoughts on the real problem to be solved; it should be a statement which is broad enough so no reasonable possible solution is eliminated.

C. State the Constraints, Assumptions and Facts

Constraints are factors which affect the outcome of the project and cannot be changed. Assumptions are applied to factors which can be changed to simplify the problem and make it solvable. Facts are statements of things that are known.

D. Generate Possible Solutions

This is the time for creative thinking. Don't prejudge ideas as they are generated; get all the different thoughts you can.

E. Evaluate and Make a Decision

Determine which possible solution is most likely to solve the problem.

F. Analysis

Separate the chosen possible solution into meaningful elements. Determine and gather the information you need to develop each element.

G. Synthesis

Combine the elements to create a detailed solution.

H. Evaluate the Solution

Does it satisfy the basic objective; is it feasible, practical, economical, safe, legal and moral?

I. Report the Results and Make Recommendations

Prepare a report that describes what you have done and decided. Think about the information needs of the person who will read the report. Don't write what isn't necessary.

J. Implement the Decision

What should be done now? Should we select a new basic objective, perform additional decision-making or research work, or begin to implement the recommended solutions?

K. Check the Results

Did the solution work? Is further 'design' effort required?

Consulting together, a team of instructors and the author (using the Guided Design strategy) set out to devise solutions for resolving problems involved with the traditional lecture. With no written feedback prepared in advance like a normal Guided Design class or experience, the group used the Guided Design decision - making strategy to arrive at a new teaching approach, The Feedback Lecture.

Guided Design Steps Used To Arrive at a Solution

A. Identify the Problem

Five Oregon State University faculty plus the author gather to discuss the problems associated with the conventional teaching approach. The lecture form of delivery is the main vehicle used for instruction. Classes range from 60 to 100 or more students, and instruction is conducted in large auditoriums accommodating the large numbers of students who are required to take the courses. Both majors and nonmajors take the courses and the courses are often rotated among the instructors. Students grade the courses extremely low and teachers instructing the subsequent courses report little student retention carried over to sequence courses. The other identifiable problems are students missing lectures, poor test result, too much content covered, poor course continuity from instructor-to instructor, double coverage of material; boredom on the part of majors, overwhelmed non-majors, and general lack of enthusiasm, direction, and

self-fulfillment. After the group (consisting of Howard, Nancy, Cheryl, Harriet, Barbara, and Dean) discussed the symptoms, they decided to pin down the problem. If you were part of this group what would you identify as the problem?

Feedback A

Harriet remarked that there is too much content for the course, "We have thirteen objectives for one lecture alone, how can we cut down on the content for the course?" Cheryl remarked, "Why don't we divide the courses in two --- majors and non-majors?" After further discussions the group felt that these again were symptoms of the problems. The real problem facing the students and instructors is the teaching method. It lacks student involvement, specific objectives, immediate feedback to students, intellectual stimulation, and any sort of self-actualization--- that of making use of students' talents, capacities, potentialities, and energy. Dean thought it would be useful to gather further information about the problem, prior to concluding the discussion.

B. Gather Information

Howard suggested that it might be useful to gather information regarding any pertinent data from the students taking the courses, comments on past course evaluations, other people involved with the course, and

questions that would be asked to get information you need. Cheryl responded, "That perhaps first it might be best to generate a list of questions to help review what we need to look for in available data; then we should get a better picture of what further symptoms fo the problems exist and this might suggest some alternative teaching forms to study." What questions would you ask to get the information you need?

Feedback B

Barbara slowly added, "I don't think we should jump to quick responses like we did earlier when we were identifying the problem. Nancy, you haven't spoken yet what do you think should be ask?"
"Well Barb, I think that we should list the following questions:

1. What was wrong with the old approach, why don't teachers and students like it?
2. What suggestions have been offered to improve the lecture format?
3. Why can't other alternative approaches be used? What does the information from student evaluations or peer observations indicate?

Dean offered a few more questions to the list:

4. How much student involvement has there been in the past?
5. Does the present teaching-learning approach guide the students' learning?
6. Does the present form of instruction provide for practice in terms of applying subject content to real situations or problems?
7. What are the objectives of the course? Are they realistic and/or related to best teaching methods?

8. Is students' work evaluated often and are they given feedback?

9. Are students' motivated?

Cheryl spoke up and said, "Let's start now to find the answers to these questions."

C. State the Goal of the Work

The group studied the list of questions and determined the answers by reviewing the available data and needs assessment responses from students and teachers of the courses. Cheryl prodded the group along by briefly summarizing the answers to the list of questions. "Why don't I answer these questions orally with the information we gathered. Question number...

1. The students didn't like the old approach because it was inflexible, no questions could be asked, it covered too much material, and no one seemed to know what to expect.
2. The most useful suggestions to improve the course centered around the subject matter, delivery methods, and course organization. Students were either bored or overwhelmed; perhaps the course can be restructured.
3. Other alternatives such as Personalized Systems of Instruction (PSI), Audio-Tutorial, and Guided Design could not be used due to the large enrollment, facilities, and courses with no proctor or tutor assistance. However, it would be possible to use components of each of these alternatives.
4. Student involvement in the past form of teaching and learning has been limited to notetaking, two papers, a mid-term, and final. The role of the student has been passive, expecting

to memorize content.

5. Students are expected to provide their own direction.
6. No provisions for practice have been offered.
7. The objectives of the course are loose and difficult to measure. Perhaps there are too many; the learner is expected to know what is presented.
8. No, students' work is not evaluated often and little feedback other than a grade is offered.
9. Students report little motivation."

"Before we go further," said Dean "we should put this information together and decide what we expect to do." Harriet responded, "OK let's decide what the goal(s) of work would be." What goal or goals would you expect to accomplish through this group work?

Feedback C

The group decided that their objective would be to select or develop a new teaching approach. "There may be an appropriate teaching/learning format already in use," added Barbara. Cheryl felt that the expertise of the group would help to determine if any other form of teaching would work.

D. Generate Possible Solutions

Cheryl opened up by stating, "Let's find the approach; how about computer assisted instruction?" "Wait a minute!" cautioned Harriet. "Why don't we look at several teaching methods before we go on, tell me all that might be available." Generate a list of any possible teaching methods that might handle the problem symptoms of the courses.

Feedback D

Cheryl was quick to respond and Howard, Dean, Harriet, and Barbara all listed a few each. Some of the suggestions were serious, some not. Their list was as follows:

Guided Design
PSI (Individualized instruction)
Lecture-discussion
Simulations and Games
Mountain retreats
Computer Assisted Instruction
Classroom Television
Musical Classroom
Learning Packages
Case Studies
Role Playing
Open Classrooms
Drop School

E. Specify the Constraints

Dean offered a suggestion at this point before Cheryl could respond. "Would it be possible to examine these approaches and note the limitations of each approach and also list the constraints faced by those instructors teaching the courses?" Barbara suggested that the plan might be useful to follow. Howard said, "Dean, your priority should be turned around --- how about starting with the constraints faced by the instructors and students exposed to the courses?" Cheryl quickly responded, "Yes, let's do that!" What constraints would you list that might be critical before adopting an alternative form of teaching or creating a new or modified teaching approach?

Feedback E

Harriet responded that perhaps the cost alone of adopting an alternative approach could keep one from using a few of these alternatives. Cheryl added, "Hey guys - - I've got my list of constraints, here they are...

1. The cost-effectiveness of the teaching approach, that is, is there a savings to the university in terms of expenses involved?
2. The feedback to students in guiding their learning, is it immediate or delayed?
3. What intellectual level is the alternative capable of handling, simple recall (comprehension), application, analysis, evaluation, or synthesis?
4. Peer and supervisors approval - will the department approve of the "new" teaching idea?
5. Time to prepare materials and revise as necessary.
6. Room size necessary, and limits on class enrollment.
7. Media necessary to teach students.
8. Amount of student assistance and help available.

Dean added, "I am impressed with your list, are there others that can be added?"

Harriet countered by listing a few more:

9. Will the teaching approach guide the student's learning?
10. Will it provide for practice? (Both in and out of class.)
11. Will evaluation be frequent?
12. Will students be motivated by the teaching approach?
13. Will individual needs and opportunity be taken into consideration?

Howard said, "What do we do now?"

F. Analysis

The group thought that it would be difficult to go on with further constraints and accepted the list. Dean suggested, "Would it be possible to look at the best features of each approach and list these? Then, we could apply our list of constraints to each approach and rule out any method." The group listed the following teaching approaches from their list.

A. Individualized Instruction (PSI)
B. Small-group discussion (Guided Design)
C. Lecture-discussion
D. Computer-assisted Instruction
E. Instructional Television
F. Simulation and Games

Barb suggested, "That maybe we should list the advantages and disadvantages of each teaching approach."

Feedback F

- Individualized Instruction

Advantages

1. Students can work at their own pace.
2. Individual's needs are taken into account.
3. Students can receive individual aid from tutors or the instructor.
4. Students can master the materials.
5. Study guides break units into small learning segments

6. Evaluation and Feedback are immediate.

Disadvantages

1. Instructors must be prepared to handle student-procrastination.
2. An efficient system of booking keeping is necessary.
3. Tutors are necessary to help grade students. (If not available, this causes problems.)
4. Mostly memorizing (knowledge, comprehension) levels are taught.

- Small-group discussions

Advantages

1. Decision-making (Guided Design) can be taught and students can be guided through content material.
2. Students learn to use other students as resources of knowledge and information.
3. Analysis, Synthesis, and Evaluation intellectual levels can be taught and reached.
4. The instructor can take on a new role as facilitator and becomes a viable resource to groups.
5. Feedback is immediate.
6. Students are applying subject content to real problems.

Disadvantages

1. Small group discussion is limited to small classes (20-35).
2. The groups may have internal personality problems and a few individuals may not work.
3. Grading group work may be difficult.
4. The group passes or fails as a group with no differences accounted for individual effort.

- Lecture-discussion

Advantages

1. A large group of people may be taught by one instructor.
2. This approach is most widely used and accepted.
3. The element of flexibility is always apparent.
4. Lecture notes may be used term after term.

Disadvantages

1. Students follow at the experience and pace of the instructor.
2. Students receive no direct practice experience, motivation, or individual help.
3. Students lack involvement or stimulating mental activity
4. Students may not feel comfortable raising questions or requesting further discussion on specific points.
5. Faculty may not be prepared to lecture or may lack preparation and appropriate delivery skills.

- Computer Assisted Instruction

Advantages

1. Students are not embarrassed when errors are made as no human monitors the students.
2. Students receive practice, rapid feedback and become motivated by success.
3. Units are broken into small segments often using a programmed-instruction format.

4. A wide variety of programs may be available teaming efforts of instructors from several universities.
5. Learning is self-paced and individualized.

Disadvantages

1. Students are not necessarily guided to apply subject content, but are directed to memorize without knowing how to use subject content.
2. Computers are expensive and not cost-effective for initial users.
3. Students often have a fear of computers.
4. It may be very difficult to generate specific instructional programs yet alone locate commercially made units.
5. Computers are a form of media and subject to "Murphy's Law."

- Instructional Television

Advantages

1. Video-tapes may be used to provide practice, give feedback, motivate, and individualize.
2. Video-tapes may be used as an appropriate substitute for the instructor as necessary.
3. Small objects used in demonstrations can be magnified with a close-up lens for increased visibility.
4. Instructors may improve classroom performance by viewing video replays.
5. Several teaching activities can be stored and used for future viewings.

Disadvantages

1. As a medium, it requires maintenance and is subject to breakdown.
2. The expense of using this teaching method is costly.
3. Instructors may face "attitude" problems as reflected from colleagues, superiors, students, or the public viewing these tapes.
4. Television users face a compatibility problem with non-standard equipment.
5. Students are accustomed to viewing quality commercial programs; they may expect only the best.

- Simulations and Games

Advantages

1. This form of learning provides practice, quick evaluation, motivation, and individual work for students.
2. Students may enjoy this activity feeling that there may be a carry over to the real world of work.
3. Theoretical concepts are demonstrated in real world problems in the classroom.
4. Games are a form of play, such as Monopoly, and offer fun plus work experiences.
5. Group projects may deliver new facts, creations, or goods to contribute for greater understandings.

Disadvantages

1. Groups may not choose to work together.

2. Students are not necessarily guided through projects.
3. Students may not like to perform on game assignments.
4. Individuals are given group grades and not rewarded for individual effort.
5. The instructor may feel lost with the decreased responsibility.

G. Evaluate and Make a Decision

Cheryl was quick to point out that, "The defects in each approach are kind of obvious, aren't they? What we need is to use the best of each approach and maybe create a new method. Is that possible, Dean?" Dean added, "Yes it is --- in fact we know that the lecture form is not working according to the research such as the following reports:

Lectures

Lectures are widely used because we are so familiar with the technique and it is reinforcing to the instructor.

(Gage and Berliner, 1975)
Retention from lecture is poor...the "forgetting curve".
With notes and outlines, students remembered 24% immediately after the lecture; one week later, the same students remembered only 17% of the materials.

(Bloom, 1953)
Approximately 30% of a listeners' thoughts were found to be irrelevant to the lecture topic and 14% were passive. Irrelevant and passive thoughts occur twice as frequently in lectures as discussions.

(Cameron, 1968)
In 21 random samples of time during a semester's lectures, 20% of the students were thinking about sex and only 20% were paying attention to the lecture.

(M/B Booklet, 1976)
Lectures work best in disciplines where practioneers agree on the major concepts, principles and skills.
Lectures work best for conveying knowledge or organizing various sources for students or to motivate them.
Research shows there is little difference between tape recorded lectures, written lectures and live lectures.

Efficient technique to get a lot of information out quickly. The instructor can synthesize information and motivate.

(Ebel, 1969)
Tape recorded lectures at the graduate level were as acceptable and as effective as conventional lecture-discussion methods.
Students remembered more from a dynamic lecture than from a static one.

(Ulrich and Pray, 1965)
Students who were both allowed and required to study on their own did as well as those required to attend formal lectures.

(Dubin and Taveggia, 1968)
A review of over 100 studies over a 40 year period showed that 51% of the studies favored the lecture method while 49% favored the discussion method. Similar results were found for 7 studies comparing lecture and lecture-discussion, also in 14 studies of lecture vs. supervised individual study and in 9 studies on lecture-discussion vs. supervised independent study. Unfortunately, the dependent variable usually was the final exam which was textbook oriented. Both groups of students thus had a chance to study the text on their own regardless of method used.

(Mckeachie, Verner & Dickinson, 1967; Blight, 1972; Costin, 1972)
These writers have concluded from their reviews of many studies that the lecture method is suitable when 1) the basic purpose is to disseminate information, 2) the material is not available elsewhere, 3) the material must be organized and presented in a particular way for a specific group, 4) it is necessary to arouse interest in a subject, 5) the material needs to be remembered for only a short time and 6) it is necessary to provide an introduction to an area or directions for learning tasks to be pursued through some other teaching method.
They also argue that lectures are inappropriate when 1) objectives other than acquisition of information are sought, 2) long-term retention is desired, 3) the material is complex, detailed, or abstract, 4) learner participation is essential to the achievement of the objectives, 5) higher cognitive objectives are sought (such an analysis, synthesis or integration), or 6) the students are average or below average in intelligence or educational experience.
(Gage and Berliner, 1975) go on to warn that administrative concerns may well override the educational points made above so we should try to improve the method as much as possible since it is widespread.

No wonder, the students react negatively to the present lecture format."

Barb remarked, "I can agree with some of the findings, but how about getting back to our goal of developing a new teaching approach. Remember that Cheryl reported that these other alternatives could not be used, but it would be possible to use components of each of these alternatives."

"Okay," stated Dean, "Why don't we list those advantages from each approach that would best fit the list of constraints from our earlier work?" Refer to your list of constraints and study your advantages and disadvantages of each approach, then list the components from each approach that could be used to create a new teaching method.

Feedback G

The group came up with the following components that they liked:

A. Individualized Instruction
   - Individual needs are taken into account
   - Students can master the materials
   - Study guides which break the units into smaller learning segments.

B. Small-group discussions
   - The group felt that all of the advantages were valuable.

C. Lecture-discussion
   - A large group of people may be taught by one instructor.

H. Synthesis

Dean offered, "If I understand what the group has determined, we will retain the lecture with modifications." He then listed those modifications.

Study Guides

Develop study guides for each lecture including a pre and post-test to evaluate students' learning, a procedure section, objectives, lecture notes, and reading assignments. Units would be broken into smaller-content segments allowing for individual needs and subject mastery.

Lecture format

Break the lecture into two parts with a discussion in between. Students

could respond in groups of two, to a discussion question providing feedback to the instructor on how the readings and lecture are applied to a real-world problem. Students would receive an immediate feedback sheet from the instructor for checking their work.

Small-group work

The group discussion could be used to guide student work, train students in decision-making, provide immediate feedback to real-world problems with students applying knowledge from readings and lectures. "Since this approach uses feedback from the students and instructor, let's call this approach the Feedback Lecture," Dean added. The group agreed and Cheryl stated, "Dean, can you describe to others how to create this new approach?"

I. Implement the Decision

How To Create This Approach (Feedback Lecture)

Each lecture is organized into a self-contained content area with learning bridges (transitions) from the previous lecture and the next one. The lectures are supplemented with study guides that are used by the students, before, during and after the class. In effect, the lecture becomes the audio-tutorial while the students are guided through the learning sequence. The components of the study guide are very important to the overall concept of the Feedback Lecture and are described in the following:

1. Cover design and Title

   The cover design illustration is a rapid eye-catching theme to open the student's mind to a "birds eye" view of the content to follow. Such designs, abstract as they may be, open the theorectical flow of information presented during the lecture and places it into

a concrete illustration of subject matter. The title, unit and lecture number, and page number are placed on the title page for coordination purposes.

2. Opening up to page two, the procedural page is provided. On this page is a description of the Feedback Lectures and suggested procedures for studying for the lecture. Such suggestions on how to use the pre and post test, most effective use of the study guide, and inspirational thoughts are provided.
3. Page three presents the Introduction to the unit presentating a descriptive theme to join the cover design and content information together in an overview, a touching, sensitive, or relating function of what is happening in the unit and/or lecture.
4. Page four lists the objectives and terminology specifically developed or used for this lecture. The objectives must not be too many or difficult to accomplish during the lecture period (first half of the lecture, 20 minutes, eight minute discussion period, and 20 minute lecture period). By reducing the number of objectives to cover, the instructor explains each point fully including restatement. For those instructors using Feedback Lecture for the first time, an immediate revelation comes to them that too much material was covered and at too rapid of a pace. Therefore, the reduction in coverage plus students becoming more responsible for content outside of the classes does two things: 1. the extraneous content areas are reduced or eliminated (jokes, stories, some personal material included), and 2. the instructor has adequate time to cover pertinent information.

5. The Pre-test is located on page five. This device opens the students' minds as to what they have gained from the readings prerequisite to the lecture. This test is not graded and answers are supplied for them at the bottom of the page. The pre-test opens a door to learn what they have not acquired and serves as a non-threatening test to practice and perhaps help eliminate test anxiety.
6. The Lecture Outline begins on page six and continues over to page seven. However, the notes provided on page six are covered during the first twenty minutes of lecture with a discussion period in between the first and second halves of the lecture. Research has indicated that learners are capable of handling 15-20 minutes of content and activity to reinforce the learning needs to take place. This activity may be flexible allowing for discussions, laboratory activity or simulations. The notes that are provided are main points guiding the instructor through the delivery. It is recommended that the instructor not read through his/her notes, but use the notes as a guide to illustrate content information.
7. As previously stated, the discussion question breaks the first half of lecture into an involving and participating stage for students. Students pair up and respond to the question(s) developed for this Feedback Lecture. The students must apply the knowledge that they have gained through the prerequisite readings, pre-test, procedural page, and first half of the lecture. The discussion question is usually placed on the far left of rows to speed up handling and usage. When the instructor computes the first half of the lecture, the students then pass the questions to their right and begin the

discussion. The students, in two's, respond to the questions by writing their feedback which is then graded later. Points are determined by the instructor's criteria of feedback response. Once the students turn in their response, the discussion question feedback is passed out. This feedback reinforces the correct concepts that should have been applied and models professional reasoning and application. (Note to potential adopters of the Feedback Lecture: students can purchase the study guides in advance of the classes; prior to their purchases- remove the discussion question and discussion question feedback from the study guide packet. These should be passed out at the appropriate lecture during the break between the first and second part of the lecture.)

8. The second half of the lecture continues and can be followed by discussion depending upon the instructor's view-point.
9. The tenth page of the study guide presents a post-test. Students can take this exam in or out of class, again, depending on the instructor's views. The post-test serves as an immediate feedback to the student as to the concepts, facts, or information learned in the unit.
10. Page eleven is used for prerequisite listings of tasks students must acquire, perform prior to the next lecture. Usually this page is called Warm Ups. Assignments may be listed, and readings, speakers to hear, video-tapes and other media input listed for warm up time and activities prior to the next Feedback Lecture.
11. The last page(s) of the study guide may be used for a glossary, reference page, or instructor notes to the students.

J. Sample of Study Guide

Cheryl requested, "Would it be possible to provide a sample of the study guide that is used with each lecture?"

Harriet provided, "We are working on my class in Clothing Textiles and Related Arts - - why don't we construct a study guide for the Economics of Clothing and use it as a sample to show others?"

"If you have your existing lecture notes, we can list the objectives to be covered and follow the "How To's" of creating a study guide for feedback lectures," added Dean. The group proceeded to construct a study guide using the guidlines as provided. (See Feedback J in the Appendix, Item One pp. 41 to 52.)

K. Check the Results

Barbara said, "Are there any results available - - I mean has anyone experimented with this form of teaching to determine if students learn or even like this form of teaching? Perhaps students would not like it at all!" Cheryl added, "Dean, haven't you been actually developing this form over some time, do you have any results?"

"Yes, a study has been done at Oregon State University (Progress Report on Improvement of Instruction by Howard P. Milleville, Extension Food Technologist, Department of Food Science and Technology, February 10, 1978) to determine if the lecture study notes, pre and post-tests, and study guides would contribute to student achievement and positive attitudes in the lectures. A review of the data indicates that the study-guides and ten-minute discussion period positively reinforced learning. And the students' response to the attitude questionnaire regarding the teaching format was positive."

"Are there any reports from recent adopters of Feedback Lecture indicating their experience with this form of teaching?" asked Nancy.

"Yes," said Dean, "I can provide you with a case study done by Betty Coffey at Montana State University. She is a recent adopter of the Feedback Lecture; you may be interested in her observations and modifications." (See Feedback K in the Appendix, Item Two, pp. 53 to 58.)

L. Evaluate the Results

Cheryl and Harriet, then, followed the guidelines as provided and devol-oped study guides for the Feedback Lecture form of teaching and learning for their class in Clothing Textiles and Related Arts. Others followed the lead of Cheryl and Harriet and are now currently using this form of teaching. Actual results on final exams as compared with traditionally taught courses produced higher mean scores from sixty-eight to ninety per cent. Working with the author, an attitudinal questionnaire was developed for evaluating the Feedback Lectures.

Section One

Please respond to each of the following questions by circling the number that best represents your attitudes regarding Feedback Lectures:

	Always	Often	Seldom	Rarely	Not at all
1. How much did you use the study guides?	4	3	2	1	0
	Extremely Useful	Useful	Just OK	Distract-ing	Not at all
2. Did you find that the study guides were useful?	4	3	2	1	0
	Extremely Helpful	Helpful	Just OK	Distract-ing	Not at all
3. Did you find it helpful to have the objectives listed in the study guides?	4	3	2	1	0
	Always	Often	Seldom	Rarely	Not at all
4. Did you answer the pretest and posttest included in the study guides?	4	3	2	1	0
	Always	Often	Seldom	Rarely	Not at all
5. Did you use the lecture outline in the study guides for studying and/or taking notes during lecture?	4	3	2	1	0
	Extremely Useful	Useful	Just OK	Distract-ing	Not at all
6. What did you think about the break (pause) in the lecture to allow for discussion with a partner?	4	3	2	1	0
	Yes	No	Undecided		
7. Did you like the idea of the discussion with a partner?	2	1	0		
8. Did the printed feedback supply information that contributed to your understanding of the discussion questions?	2	1	0		
9. Did you like the idea of knowing what is expected of you prior to attending the next Feedback Lecture?	2	1	0		
10. Do you think that the Feedback Lectures as a teaching/learning method of instruction helped you to understand the subject material?	2	1	0		

	Regular Lecture	Feedback Lecture
11. If you have a choice in the future about a regular lecture course or a course using Feedback Lectures which would you prefer?	2	1

Section Two

Rate the quality of the Feedback Lectures by circling a number as provided in terms of the degree to which they:

	Excellent	Good	Fair	Poor	Not Applicable
12. Held your attention and interest	4	3	2	1	0
13. Covered the material at an appropriate intellectual level - neither too complicated nor too simple	4	3	2	1	0
14. Clearly presented the relevant subject matter	4	3	2	1	0
15. Stimulated your curiosity	4	3	2	1	0
16. Stimulated student discussion outside of class	4	3	2	1	0
17. Were related to one another and followed a coherent sequence	4	3	2	1	0
18. Were coordinated with other parts of the course	4	3	2	1	0
19. Rate the quality of the study guide, audio-visual materials used in class and lectures in Feedback Lecture Format.	4	3	2	1	0
20. In comparison with all other core courses in Home Economics at Oregon State University, how would you rate the Feedback Lecture section in this course?	4	3	2	1	0

Section Three (use the back, if needed)

Comments:

Feedback L

Over a three-term study with an average classload of ninety-one students per term, Harriet and Cheryl received a higher gain in student evaluations, and positive response from colleagues and administration. The results of the evaluation (compiled over three terms and averaged with a total of two-hundred and seventy-three students) were as follows:

Section One	Highest Percentile Scores	
1.	89%	often
2.	82%	useful
3.	81%	extremely useful
4.	72%	often
5.	89%	always
6.	79%	useful
7.	81%	yes
8.	79%	yes
9.	93%	yes
10.	90%	yes
11.	88%	Feedback Lecture

Section Two		
12.	78%	good
13.	71%	excellent
14.	74%	excellent
15.	61%	good
16.	58%	fair
17.	73%	excellent
18.	82%	good

Section Two cont.	Highest Percentile Scores cont.	
19.	91%	good
20.	79%	excellent

Comments

The Feedback Lecture is a definite attempt to apply psychological principles and improved conditions to the learning tasks delivered via the lecture format. Certainly other forms of teaching may produce similar or improved results, the author realizes this point. The Feedback Lecture is a compromise between traditionalists and liberals. The psychological components used are:

1. repetition and reinforcement
2. student involvement and activity
3. verbal learning
4. positive transfer paradigms
5. organizational factors in increasing memory
6. motivation
7. a model with a rehearsal buffer
8. opportunity to exercise decision-making
9. stimulus situation
10. concept learning and principle learning
11. problem solving
12. positive guidance and direction

In organizing a course using Feedback Lectures, it is advisable to plan your instruction by using an outline for supplying the information called for in putting together several units.

Course Outline

Units Topics Student Assign.

A unit outline should be used prior to the development of the study guide.

Unit Outline

Unit #, Lecture #

1. Topic
2. Specific Concepts to be Developed
3. Supportive Illustrations or Graphs
4. Prerequisite Assignments, Readings
5. Procedures
6. Theme
7. Objectives (Student Outcomes)
8. Abstract of Information to be Covered
9. Pre- and Post-test
10. Content Outline (Notes)
11. Discussion Question
12. Discussion Question Feedback
13. Student Assignments & Activities (Feedback Activities)
14. Warm Up Activities
15. Glossary, References, Instructor Notes

Components of Feedback Lecture

The Feedback Lecture is part lecture, and part student involvement. The variables underlying have been described in the previous pages. The components are as follows:

1. Organized units with coordination from beginning to end.
2. Lectures that provided uniformity, clarity, and space for adequate content coverage.
3. Feedback Activity for the instructor and students to determine inferences for the teaching/learning process.
4. Feedback Lecture Study Guides with
   a) cover design and title
   b) procedure page
   c) introduction (theme) page
   d) Objectives and terminology page
   e) pre-test page
   f) lecture outline (first-half) page
   g) discussion question
   h) discussion question feedback
   i) lecture outline (second-half) page
   j) warm up activities page
   k) glossary, references, instructor notes page
5. Learning Principles based up psychological conditions of learning.

Conclusion

There are other forms of supplying feedback to the instructor and to the students. The electronic circuit board providing buttons at each student table or desk wired to a computer with display is useful for obtaining feedback. Such devices used in University of Missouri, Kansas City and Syracuse Universtiy are used in this capacity. Students are provided with response buttons to feedback information either for tests, responsive questions, or activity that can be conducted during the eight minute discussion

of the Feedback Lecture. The student is rewarded with involvement and participation, the key to active learning.

For the case of the Feedback Lecture, it is working. Both instructors and students report satisfaction. The conventional lecture is not receiving such reports, the evidence is both descriptive and available. Instructors who for years have realized this have been "hand-cuffed" to the conventional lecture for obvious reasons. Now, they may be in a position to adopt the Feedback Lecture and benefit from the compromise of the tradition expectations and advantages of this form of teaching.

Despite the doubts commonly expressed about the valve of the lecture method, it undoubtedly possesses advantages as well as disadvantages. At the same time, it can be effectively used by revising the lecture format and allowing for teachers to develop materials. By way of conclusion, the following quotation is offered for contemplation:

"...The difference between the poorly prepared lecture and the good one is appreciable and is worth striving for. You are not likely to stimulate much enthusiasm in your students if your...matter is incomprehensible." (Gage, 1969).

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Feedback J.

The Physical Factors Which Influence Thermal Comfort or What Your Parents Didn't Tell You About Why You Should Wear a Hat

UNIT I, LECTURE I

Procedure for Section III, The Economic Aspects of Clothing

Study and Lectures for Section III, The Economic Aspects of Clothing, are based upon the concept of "feed-back lectures." This packet is your study guide and includes objectives for each lecture, the reading and homework assignments, and outlines of the lectures and discussion questions which will be utilized during class. A pre-test and post-test accompanies each unit.

The most effective use of the study guide for each lecture is as follows:

1. Read the objectives.
2. Complete the pre-test.
3. Read the assignment.
4. Write definitions for the terms listed on the objectives page.
5. Check the answers on the pre-test with those provided at the bottom of the page.
6. Review the reading material for those questions which you missed.
7. Bring the study guide to lecture and use the lecture outline for note taking.
8. Use answers provided during lecture to compare your written answers to the discussion questions.
9. Complete the post-test.
10. Complete the homework assignment.
11. Repeat the process outlined in steps 1-10 for the next lecture.

UNIT I - INTRODUCTION:

Clothing is referred to as the "second skin" that interfaces with your psychological, social, aesthetic and physical environments. Humans can adapt to almost every environmental condition on the planet Earth- and beyond -by using clothing as a protective skin.

In Unit I of Economic Aspects of Clothing, we will be exploring a basic purpose of clothing which is to assist the physiological functions of the human body to adapt to its immediate environment. Our goal is to expand your knowledge of the ways on which clothing can help to make your life comfortable. In the following three lectures we will talk about:

1. The art of keeping warm or cool- what one's body can do and what we as thinking beings can do.
2. How clothing can provide thermal comfort, safety and protection.
3. How clothing can extend our ability to perform in various climatic conditions or specific activities.

PHYSICAL FACTORS WHICH INFLUENCE THERMAL COMFORT

OBJECTIVES:

1. Identify one internal and one external means by which a person can maintain thermal comfort of the body.
2. Define the four processes by which heat is lost from the body.
3. Describe how body heat is lost by radiation, convection, conduction and evaporation.
4. Describe the physical changes of the circulatory system to maintain body temperature.
5. Explain the processes of sweating and shivering to maintain thermal comfort.
6. Define and give an example of acclimatization.
7. Define and give an example of accustomization.
8. Identify some of the physiological differences between men, women and children which affect the clothing required for thermal comfort.
9. List five environmental factors which affect thermal comfort.
10. Given the homework exercise that outlines differing climatic conditions and activity levels list the considerations in selecting clothing to achieve thermal comfort in these situations.

TERMINOLOGY:

Physiological
Radiation
Conduction
Convection
Evaporation
Kilocalories
Asphyxia
Hypothermia
Acclimatization
Accustomization

Factors Which Influence Physiological Comfort

PRE-TEST:

1. Thermal comfort is created within the human body by:

2. Thermal comfort is maintained by _____ which creates a buffer or barrier between the body and its environment.

3. In cold weather, 50% or more of one's body heat is lost from the head, neck and ears by the process of:
   A. Conduction.
   B. Convection.
   C. Radiation.
   D. Evaporation.

4. A learned response which enables a person to adapt to the environment exemplified by carrying an umbrella on a rainy day is called:
   A. Acclimatization
   B. Accustomization
   C. Following mother's directions

5. The environmental factors which affect thermal comfort are:
   A. Temperature
   B. Temperature, humidity
   C. Temperature, humidity, air movement
   D. Temperature, humidity, air movement, solar radiation
   E. Temperature, humidity, air movement, solar radiation, atmospheric pressure

ANSWERS:

1. Body heat is generated by the metabolizing of food in the tissues and muscles.
2. Clothing acts as an insulator between the body and the environment to maintain the heat that the body has created or to allow this heat to dissipate when the body becomes overheated.
3. C. Radiation
4. B. Accustomization
5. E. Temperature, humidity, air movement, solar radiation, atmospheric pressure

Physical Factors Which Influence Thermal Comfort

LECTURE OUTLINE:

I. Thermal comfort (refer to Horn, pp. 296-299)

A. Maintained by two means:

1. internal- metabolizing food in tissues and muscles

2. external- insulating the body with clothing

B. Body heat transfer

1. radiation

2. convection

3. conduction

4. evaporation

II. Human physiological adaptation to the environment (refer to Horn, pp. 301-303)

A. Circulatory system

B. Sweating

C. Shivering

D. Acclimatization

E. Accustomization

(note: the lecture will stop at this point and the discussion will begin, please pair up in groups of two's and answer the question(s) on page I-8. When completed (or after 8 minutes) turn in your response and collect a discussion question feedback. The lecture will begin again after the discussion period. The discussion question feedback is removed from your study quide.

Physical Factors Which Influence Thermal Comfort

LECTURE OUTLINE: (Continued)

III. Individual physiological differences

A. Metabolic rate

B. Physical condition of the body

C. Sex

D. Age

IV. Influence of environmental factors (refer to Horn, pp 299-301)

A. Temperature

B. Humidity

C. Air movement

D. Solar radiation

E. Atmospheric pressure

V. Need for clothing is determined by:

A. Food intake

B. Physical activity

C. Physical condition of the body

D. Extremes of temperature

E. Duration of exposure to adverse environment

DISCUSSION QUESTIONS:

Your living group has "adopted" two elementary school children and you have volunteered to spend a day at the coast acquainting them with the flora and fauna. Saturday noon you and a friend of the opposite sex pack a picnic lunch and put it in the trunk of the car so no one can snack en route. The sun is shining, the temperature is 27°C (81°F) in Corvallis and everyone is dressed for thermal comfort on a warm fall day.

You drive for three hours without stopping. As you approach your destination you see a squall line developing over the ocean and when you get out of the car, you feel the cool ocean breeze. You immediately feel chilled and start to shiver.

1. What are the physical reasons that you feel chilled?

2. What processes of body heat transfer are occurring?

The children are so exhilerated that they run rapidly up and down the sandy beach. They are not shivering.

3. Explain why they do not have the same physical response to the change in weather that you had.

Soon the squall line moves closer, and they, too, begin to feel chilled. Your knowledge of the idiosyncratic coast weather alerted you to bring additional clothing so you provide everyone with a wool sweater and vinyl poncho.

4. Your learned response which enables you to adapt to environmental change is called _____.

DISCUSSION QUESTION FEEDBACK:

1. How many of the following reasons for feeling chilled did you list?
   a. sudden change in temperature from a warm environment and the protection of the car to a cooler temperature accompanied by chilling winds
   b. cloud cover reducing solar radiation (warmth from the sun)
   c. sedentary activity- sitting in the car for three hours
   d. low energy level due to lack of food intake for a considerable period of time

2. Heat loss due to convection and radiation.

3. The children are involved in an intense physical activity creating body heat. In general, children have a higher energy level(metabolic rate is faster) than adults. Thus they do not need as many clothes when active.

4. Accustomization

Physical Factors Which Influence Thermal Comfort

POST TEST:

1. From the following, select the only group which includes one external and one internal means of maintaining thermal comfort.
   A. eating and exercise
   B. turning up the thermostat and wearing long johns
   C. eating nutritious food, adding or subtracting clothing
   D. drinking cold beverages, eating salads and ice cream

2. The backpacker whose feet become wet from rain will lose body heat through:
   A. radiation
   B. convection
   C. conduction
   D. evaporation

3. The body speeds up heat loss as an adaptation to overheating by:
   A. shivering
   B. dilating the blood vessels
   C. sweating
   D. acclimatizing
   E. both B. and C.

4. An inactive, overweight person is not necessarily better insulated from heat loss in cold temperatures than the "average" person because:
   A. the circulatory system functions at a faster rate
   B. the circulatory system functions at a slower rate

5. If one's circulatory system functions at a slow rate, the skin temperature is:
   A. lower, making the person feel cool
   B. higher, making the person feel warm

ANSWERS:

1. C. eating nutritious food, adding or subtracting clothing
2. C. conduction
3. E. both B. and C.
4. B. the circulatory system functions at a slower rate
5. A. lower, making the person feel cool

ASSIGNMENT, LECTURE 2:

Horn, Chapter 15, pp. 303-310

Brain Warm Ups (on following page)

BRAIN WARM UPS (alias home work exercises to be completed before Lecture 2.)

rm Up
I

It is late February and you are planning a weekend cross-country ski adventure in the Cascades. For the past four years you have lived in Reno where you were introduced to the sport of Nordic skiing in the Sierra Nevada Mountains. You are eager to share this experience with your new friends in Oregon who are novice skiers. They have asked you to prepare a list of clothing items that they should pack for the trip.

The environmental conditions in Nevada were as follows:

- -Daytime temperatures reached 0 to 7 degrees C. (30 to 45 degrees F.)
- -Crystal clear sunny days with afternoon winds of moderate to strong velocity
- - Relative humidity 8% maximum
- -Elevation approximately 2,360 meters (8,000 ft.)

You have been monitoring the weather reports in the South Santiam for the past week and they are summarized as follows:

- -Daytime temperatures range from -0 to 0 degrees C. (30 to 35 degrees F.)
- -Overcast days with intermittent sun
- -Relative humidity ranges from 50% to 100% (rain turning to sleet in late afternoon)
- -Elevation approximately 1,475 to 1,770 meters (5,000 to 6,000 ft.)

Your skiing wardrobe while in Nevada included: cotton knit long johns, cotton corduroy knickers, wool socks and hat, cotton turtleneck, wool V-neck sweater, nylon windbreaker, lined leather mittens and sunglasses with dark lenses. Your friends have decided to make the trip to the Cascades because of your enthusiasm and experience in the sport and your promise of a fun weekend. Considering the apparel used in Nevada, compose a list of clothing that will provide thermal comfort for the Cascade Adventure.

Up
I

The following letter was written to you by a friend who graduated from Oregon State University last spring.

September 15, 1978

Dear _____,

My dietetrics internship at Barnes Hospital in St. Louis, Missouri is an exciting challenge in many ways. I was fortunate to find a beautiful yet inexpensive new apartment though I must walk six blocks to the bus and ride for 20 minutes to the hospital. Sometimes the bus air conditioning does not work but when I arrive at the hospital, it is climate controlled at 21° C. (70° F.) The daytime temperature highs in St. Louis have been between 27° C. (80° F.) and 38° C. (100° F.) and the relative humidity ranges from 50% to 95% so my body must acclimitize to an environment that is distinctly different from Oregon. It is HOT!

One problem I have is selecting the proper clothing for work. We have a choice of wearing a white, polyester uniform or street clothes covered

by a cotton laboratory coat with long sleeves. I know you are knowledgeable in this area and could list for me the considerations in selecting clothes to achieve optimal thermal comfort.

Please answer by Wednesday!

No sweat!

(Jane) (Jim)

P.S. I met a neat member of the opposite sex on the bus yesterday!

CASE STUDY --- FEEDBACK LECTURE

About the author - Betty Coffey; 6479 S. 19th; Bozeman, MT. 59715. Instructor IE/CS Dept. at Montana State University (3 years). High school math teacher (8 years). BA - Mathematics, MS - Industrial and Management Engineering (Computer Science emphasis).

Two introductory computer science programming classes at Montana State University (MSU) are offered for non-degree CS students. Many curriculums on campus require a computer science class and others recommend a CS course as an elective. The CS 101 course is offered for Engineering and Science students while the CS 111 course is offered for the general campus and little math background is expected. These two courses are offered every quarter and the yearly population of these courses has increased considerably as the following figures show.

	CS 101	CS 111
1973-74	212	60
1974-75	314	99
1975-76	348	109
1976-77	404	118
1977-78	398	141
1978-79	467	246
1979-80 (autumn and winter only)	276	196

When the author was a high school teacher 35 students was considered a large class because individual contact with students was fairly restricted. The CS 101 and 111 classes by ranging in size from 80 to 150 students have made it difficult to establish individual contact with many students. The traditional lecture method appeared to be a necessary format for these classes but it was difficult to be relaxed and interact with the students. "All those

students sitting with pencils poised waiting to copy every word!" Factual information can be transmitted this way but it is difficult to be sure if the students understand the ideas presented.

Dissatisfaction with the teaching format was the main reason for the author's participation in an Instructional Development Workshop presented for the MSU faculty. A number of instructional techniques were offered, but the feedback lecture described by Dean Osterman seemed the best method to incorporate in large lecture classes. Fortunately, at the time of the workshop the author was teaching a summer school class and the students were willing to be guinea pigs to test out this new approach. Study guide units were developed day-to-day for the class. The format for the units was an abbreviated version of the recommended structure. Each unit had an introduction, a list of objectives, a glossary of terminology and lecture outlines for one or more lectures, as well as discussion questions and feedback. Each unit covered a particular area of the curriculum. Pre- and post-tests were not included because of the time factor.

In class, after the first part of the lecture was presented, students were given the discussion questions and worked together in pairs. They became active participants in the class, not passive watchers. Students learn from each other at this time which concepts they don't understand, and can get help from the instructor. This part of the class is the most exciting because the students seem to come alive and their enthusiasm is felt. How can a student not listen more closely to a lecture when they know that soon they'll be answering questions directly related to the material and sharing their knowledge with another person?

The summer school class used the original units and made recommendations about what they did or did not like. Using these ideas the original units were rewritten and additional units developed.

The new study guide was used for the fall with classes of 150 and 110 students. These classes were the big test. The feedback lecture had been well accepted by the summer school class of 30 students, but would it work effectively with a larger class? In the fall quarter, discussion questions were passed out during the class, students would answer the questions, turn in ONLY the answers, and then receive the feedback to the questions. The process worked smoothly, but the students had many loose sheets of paper scattered in their notes.

The students were asked to evaluate the study guide and the feedback lecture method half-way through the fall quarter. At this point, a rewriting and expansion of the guide was considered, and the author wanted to know if it was worth the time and effort. Also, was there anyway to eliminate all the paper? The response to the study guide was overwhelmingly positive. The guide was an additional expense for the class, but the students definitely felt it was worthwhile, and questioned why other professors didn't use a similar method.

Students liked having the lectures outlined. Their comments mentioned that their notes were better organized, that they appreciated knowing what to expect in the next lecture, that they were better able to study for tests, that the many examples in the guide helped in writing programs for assignments, that notes were more ordered, extensive and precise, and that they were able to pay closer attention to the lecture and did not have to write as much since the programs and examples were included in the guide.

The study guide included many program examples that, in the past, were written on the board. This took the class time, and often students would be writing instead of listening to the explanation of the program. The examples are also on overheads that can be projected and then discussed more thoroughly. As one student mentioned, 'copying programs is a drag'.

In addition, they felt the discussion questions and break were 'A Breath of Fresh AIR' allowing the students to wake up and start functioning again. Other student comments concerning the discussion questions were: renews interest, stops boredom; answering the questions produces a feeling of understanding or allows the student to ask a specific question; helps students to get involved; 'I couldn't listen to anyone that long'; makes lecture shorter; 'gets you thinking about the lecture and makes me listen more closely'. Very few preferred taking their own notes or listening to a traditional lecture.

Below is a list of the questions asked at the midpoint of Fall quarter and then a breakdown of the students responses. Question 3 and the additional comments are not included.

Evaluation for CS 101 and 111

The use of the Study Guide and Lecture Outline is new this quarter. I would appreciate an honest response from you in order to determine its worth to you the student.

Study Guide and Lecture Outline:

1. Is the Guide helpful in understanding the material presented in class?
2. Would you rather take your own notes without the Guide?
3. Can you suggest any revisions or additions in the Study Guide? (Be as specific as you can).

Any additional comments?

Discussion Questions:

4. Are the discussion questions during class helpful in understanding the material presented?

5. Are the discussion questions helpful in studying later?

6. After the break for the discussion questions are you able to again concentrate on the lecture?

7. Would you prefer a straight lecture without the discussion questions?

Any additional comments!!!

Student Responses - 180 TOTAL

Question	Response		
	Yes	No	Indefinite
1	171	2	7
2	7	165	8
4	156	13	11
5	139	17	24
6	155	6	19
7	14	158	8

Based on the evaluations and many consultations with students concerning the questions and the feedback, the author decided to incorporate the questions into the study guide. The questions are now located at the end of each unit, and the feedback is in an appendix at the end of the guide. The questions are used as a learning aid and not for test purposes. Students attending class and participating in discussions can earn extra credit points. The answers are not graded or returned. The students can earn 500 points for tests (205), assignments (245), and a paper (50). A total of 12 extra credit points can be earned for the discussion questions.

The author has no doubt that the feedback lecture is in every way superior to the traditional lecture. Both the students and the teacher gain more from a class using this method. Would you like to incorporate the feedback lecture method?

Anyone interested in developing the feedback lecture should probably begin small and expand gradually unless extra time is available. Start by incorporating the discussion questions into your class. Then begin writing the lecture outlines for particular units or topics. It may take time to develop the whole series but this helps to better organize the lectures for classes.

Remember, the guide doesn't have to be perfect and will probably never be finished. The study guide is an outline which can be general enough to adapt to change and can always be expanded. It is flexible for presenting ideas as you are delivering content. The lectures are an outline, not a total picture. The feedback lecture using the discussion questions will be an improvement for the students, increase active participation in the class and, hopefully, increase the students' enthusiasm for and knowledge of the course.

In conclusion, the feedback lecture utilizing the study guide and discussion questions improves presentation in especially large lecture classes by:

(1) organizing the content of the class;

(2) having students become active participants in the class; and,

(3) allowing students a reinforcement and awareness of material daily instead of just at test time.